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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,202	03/10/2005	Mitsushi Itano	Q86826	2273
23373	7590	05/02/2007		
SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER TADAYYON ESLAMI, TABASSOM	
			ART UNIT 1709	PAPER NUMBER
			MAIL DATE 05/02/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/527,202

Applicant(s)

ITANO ET AL.

Examiner

TabassomT Tadayyon-Eslami

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 06082005, 100305, 013107
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

***Claim Rejections - 35 USC § 102/103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1-13, 15 and 19-20 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Rangarajan Jagannathan (US Patent Number: 6200891), here after Jagannathan.

Claim 1 requires on the etching solution with etching rate of 2 Å/min and etch rate ratio of 50 or less for thermal oxide film and high k film.

Jagannathan teaches a solvent comprising of HF (a fluoride-containing compound and an organic solvent, such as diglyme, for removing the oxides such as those commonly used in interlevel dielectrics.

It also teaches,

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The liquid composition used in the methods of the invention can be produced by adding the fluoride-containing compound as a non-aqueous component such as by bubbling anhydrous HF gas into the desired organic solvent or by using an organic fluoride (preferably water-free).

Undesired water in the organic fluoride may be removed by addition of anhydride as discussed above [Column 4, line 15-21].

While Jagannathan does not explicitly teaches the etch rate and ratio of etch rate and relative dielectric constant properties, these properties are a result of the composition of the etching solution. Therefore, since Jagannathan teaches using the same materials (e.g. HF and diglyme) as applicant teaches in example 3 (table 1) in the etching solution in overlapping proportions (e.g. from 0.5 to 15 mol/liter of HF which would include 20-25% HF by weight) it is reasonable to presume that the etching solution of the said reference would inherently have the claimed properties of claims 1-5. The burden is upon the application to prove otherwise. *In re Fitzgerald*, 205 USPQ 594.

In the alternative, it would have been obvious to have chosen 20-25% HF because it is within the range disclosed by Jagannathan, the claimed properties would obviously have been provided by the process disclosed by Jagannathan and to have omitted water because Jagannathan prefers water free solvents. *In re Best*, 195 USPQ 433, footnote 4 (CCPA 1977).

Therefore,

With regard to the high k film recited in claims 1-5, the limitations are directed to the properties of the composition and the film is not given patentable. The compositions of Jagannathan overlap those of applicant and therefore must possess the same properties.

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Claim 6 –8 is rejected, since Jagannathan discloses the claimed HF at overlapping concentrations and organic solvents as set forth above.

Claim 9-12 and 15, is rejected since Jagannathan discloses using diglyme as the inorganic solvent (claim 1).

Claim 13 is rejected since Jagannathan discloses using gamma-butyrolactone as the organic solvent (claim 1).

Claim 19 is rejected since Jagannathan discloses using sulfolanes as the organic solvent. Jagannathan teaches (column 4, line 22).

Claim 20 is rejected over Jagannathan, Jagannathan teaches a removal solvent for dielectric materials comprises 0.5-15 molar of fluoride-containing compound and an organic solvent wherein said organic solvent is selected from the group consisting diglyme (claim1). For the solvent with 5 molar of hydrofluoric acid, with the density of diglyme equal to  $0.937 \text{ gr/cm}^3$ , if we consider 1 liter of the solution ( $937+100=1037 \text{ gr}$ ), and we have ( $5 \times 20=100 \text{ gr}$  of HF in the solution). Therefore the % HF in the solution is  $100/1037=\%10$  which is greater than %3. Also the % diglyme is  $937/1037=\%90$ , which is between 50-97% also the % water, is %0 which is less than %3.

Therefore, all of the conditions for rejecting the claim 20 have been met.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 16 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rangarajan Jagannathan (US Patent Number: 6200891), here after Jagannathan in view of Zuel et. al. (US Patent number: 5120605) here after Zuel.

Claim 16 is rejected because although Jagannathan teaches the etching solvent comprising of hydrofluoric acid and an organic component e.g. diglyme, it does not teach using the specific all claimed ethers. However, Zuel teaches an etching solution for oxide surfaces comprising hydrofluoric acid and ether, diethylene glycol diethyl ether and diethylene glycol monomethyl ether [column 4, line 39-42]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have hydrofluoric acid and diethylene glycol monomethyl ether as etching solution, because it is suitable for etching oxides.

Claim 14 is rejected since Diethylene glycol monomethyl ether has a hydroxyl group in the molecule.

Claim 17 is rejected under under 35 U.S.C. 103(a) as being unpatentable over Rangarajan Jagannathan (US Patent Number: 6200891), here after Jagannathan and Paul D. Dodge (US Patent: 4469525), here after Dodge, Jagannathan teaches the etching solvent comprising of hydrofluoric acid and an organic component suitable for etching oxides materials. However it does not teach using acetates as a specific organic solvent. Dodge teaches an etching solution for etching oxides such as concrete (abstract) comprising strong mineral acids, such as HF (table

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1), with solvents, such as cellosolve acetate, also known as ethylene glycol monoethyl ether acetate (Table 1, solution j). However, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a solution comprising of HF and cellosolve acetate because Dodges teaches that it is suitable solvent for strong mineral acid composition to etch the oxides.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rangarajan Jagannathan (US Patent Number: 6200891), here after Jagannathan and Klein et. al.(US Patent Number: 2003/0160026), here after Klein.

Jagannathan teaches the etching solvent suitable for etching the oxides comprising of hydrofluoric acid and an organic component and it does not specifically teach specific ether. Klein teaches an etching medium comprising ethylene glycol monobutyl ether [claim10] and hydrofluoric acid [0048] for etching oxide surfaces. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a solution comprising ethylene glycol monobutyl ether and hydrofluoric acid to obtain an etching solution for etching the oxides, because it is suitable for etching the oxides.

Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rangarajan Jagannathan (US Patent Number: 6200891), here after Rangarajan and Christenson et. al. (US Patent: 2003/0235985) here after Christenson.

Jagannathan teaches,

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The etching solution comprising hydrofluoric acid and organic solvent for etching the oxides and does not teach the method for etching the silicon oxide, high k film and the gate electrode. However, Christenson teaches,

A process for etching high dielectric constant films more rapidly than coexisting SiO<sub>2</sub>, polysilicon, silicon and/or other films [abstract] comprising a solvent with at least one fluoride species [claim 30]. Christenson further teaches the method for selectively etching the high k dielectric (higher than 8, such as HfSiO) films with respect to silicon dioxide and a gate electrode [0027] comprising at least one fluorine ion, such as commonly used concentrations of HF [0032, 0020].

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method to produce the same structure than applicant claimed by the method in which Christenson used, etching solvent comprising HF and an organic solvent, because the resulting structure seems to be identical with applicant etched article. The etched structure that obtained with the above method of is identical with what applicant has obtained.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claim15 is rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant(s) regard as their invention. Where applicant



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acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term gamma-butyrolactone in claim 15 is used by the claim to mean an ether, while the accepted meaning is lacton. The term is indefinite because the specification does not clearly redefine the term.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to TabassomT Tadayyon-Eslami whose telephone number is 571-272-1885. The examiner can normally be reached on 7:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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MICHAEL B. CLEVELAND  
SUPERVISORY PATENT EXAMINER